

Attorney Docket: 173/50483  
PATENT

composed of a polycarbonate made from a bisphenol in which at least 25% of the bisphenol units in the polymer chain are tetrahalogenated with chlorine or bromine, and said mixture is fed to said membrane separator at a membrane feed pressure of 10 to 13 bar.

#### REMARKS

Favorable consideration and allowance are respectfully requested for claims 1 and 3-7 in view of the foregoing amendments and the following remarks.

In the Office Action dated July 29, 2002, claim 7 was rejected under 35 U.S.C. § 102(e), as being anticipated by U.S. Patent No. 6,004,377 ("Tamata"); claims 1, 3, and 4 were rejected under 35 U.S.C. § 103(a), as being unpatentable over U.S. Patent No. 5,785,741 (the "'741 patent") in view of U.S. Patent No. 4,838,904 ("Sanders") and U.S. Patent No. 5,855,647 (the "'647 patent"); and claims 2, 5, and 6 were rejected under 35 U.S.C. § 103(a), as being unpatentable over the '741 patent in view of Sanders and '647 patent and further in view of Tamata. These rejections are traversed.

Claim 1 has been amended to include the limitations of claim 2; claim 2 has been cancelled. It is respectfully requested that claims 1 and 3-7 be allowed.

Tamata discloses a system for processing SF<sub>6</sub> gas from gas-insulated machines, e.g., transformers, which are filled with 10 cubic meters of SF<sub>6</sub> gas (see col. 6, line 15). In contrast, the gas insulated lines of the invention contain a far greater quantity of a SF<sub>6</sub>/N<sub>2</sub> gas mixture. Table 3 of Tamata shows the composition of deteriorated SF<sub>6</sub> gas before processing where the impurities are neutralized and adsorbed. Tamata's focus is to separate the impurities, especially the acid impurities, such that little waste develops, which is

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accomplished by filters which are filled with dry adsorbers. The separated solids or uncondensable gases are burned in an incinerator (see col. 9, lines 1 and 2). On the other hand, the present invention seeks to recover  $\text{SF}_6$ .

The Examiner relies on Figures 7 and 8 and Columns 13-14 of Tamata; however, this disclosure merely discloses an embodiment using a film filter for the selective separation of air (see, e.g., col. 13, line 44 to col. 14, line 6). According to Tamata, the acid gases and  $\text{SO}_2$  are separated on the first filter, the remaining gases on the second filter, the moisture on the third filter, and air ( $\text{N}_2$ ,  $\text{O}_2$ ) on the fourth filter. Tamata only discloses that the fourth filter can be a hollow thread film filter.

Thus, it is clear that different methods and separation techniques are employed by Tamata compared to the claimed invention. While both employ mobile apparatus, the claimed invention recites a specific membrane for separating a mixture of  $\text{SF}_6$  and  $\text{N}_2$ , which preferentially passes  $\text{N}_2$  to obtain an  $\text{SF}_6$  enriched retentate and a  $\text{N}_2$  enriched permeate. Additionally, the  $\text{SF}_6/\text{N}_2$  gas mixture of the invention is taken from gas-insulated conduits, e.g., earth cables, wherein the amount of gas to be separated is substantially greater than the amount of gas which is used in the gas-insulated machines of Tamata. Moreover, according to the claimed invention  $\text{N}_2$  is separated as permeate in the first membrane stage compared to the fourth filter of Tamata. Notably, the claimed invention does not include dry adsorption as does Tamata. And finally, in the claimed method the separated nitrogen may be released into the air, as no pollutants need to be removed by burning or incineration as required by Tamata. Thus, significant differences exist between Tamata and the claimed invention.

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The '741 patent discloses a method for the separation and recovery of perfluorocompound gases by the use of membranes. Under the disclosed conditions, perfluorocompound gases can be separated as retentate.  $\text{SF}_6$ , however, is largely destroyed during semiconductor manufacture (see, e.g., col. 12, line 50). Moreover, the examples provided by the '741 patent do not disclose a method for achieving highly concentrated  $\text{SF}_6$  after the membrane separation as a single substance. According to the examples, a purified gas mixture of perfluorocompound gases, not a concentrated stream of  $\text{SF}_6$ , is obtained. Thus, the membranes disclosed by the '741 patent are not selectively acting membranes for the recovery of  $\text{SF}_6$  as claimed. Additionally, the '741 patent does not disclose the claimed feed pressure.

The '647 patent discloses a membrane separating method using a plurality of membranes, as is recited in claim 7. On the other hand, applicants have claimed a selectively acting membrane, from the great number of known membranes, whereby gas mixtures having a high  $\text{SF}_6$  content may be recovered. The gas mixture of the '647 patent is fed at about 9 bar or less, which is outside of the claimed pressure range of 10 to 13 bar. Additionally, Tables 1, 2 and 3 of the '647 patent disclose a gas mixture containing 0.01 to 0.1 vol % of  $\text{SF}_6$ , and claim 2 recites that the gas mixture contain up to about 10 vol %  $\text{SF}_6$ . The claimed invention recites a much richer feed stream. Thus, there are many differences in the process parameters between the '647 patent and the claimed invention.

Sanders discloses a selectively acting membrane for the separation of  $\text{O}_2/\text{N}_2$  mixtures, wherein  $\text{N}_2$  is separated as a retentate, which is contrary to the

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claimed invention. Furthermore, Sanders does not disclose or suggest that the disclosed membrane is suitable for separating mixtures of  $\text{SF}_6$  and  $\text{N}_2$ .

Therefore, the combined teachings of the '741 patent, Sanders, and the '647 patent do not disclose or suggest the claimed invention, and Tamata does not cure the deficiencies. Of the many known membranes, the combination of references does not disclose a process employing the specifically recited membrane, and operating at a feed pressure of 10 to 13 bars, for separating mixtures of  $\text{SF}_6$  and  $\text{N}_2$  from gas insulated lines, where  $\text{SF}_6$  is separated as retentate, and  $\text{N}_2$  is obtained as the permeate, which may be readily discharged to the atmosphere. Moreover, Sanders describes only the suitability of the disclosed membrane for the separation of  $\text{O}_2/\text{N}_2$  mixtures, without reference to  $\text{SF}_6$  and  $\text{N}_2$ . In fact, even the applied combination of references with Sanders fails to teach or suggest the suitability of the membrane for  $\text{SF}_6$  separation.

It is respectfully requested that the rejection of claims 1 and 3-7 be withdrawn.

If the prosecution of this application can be advanced by a telephone conference, the Examiner is requested to call the undersigned.

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If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response; please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket #173/50483).

October 23, 2002

Respectfully submitted,



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MARKED-UP VERSION TO SHOW CHANGES

IN THE CLAIMS

Please amend claim 1 as follows:

1. (Amended) A process for separating a mixture of SF<sub>6</sub> and N<sub>2</sub> the  
SF<sub>6</sub>/N<sub>2</sub> mixture being obtained from a gas insulated line, comprising introducing  
the mixture to a mobile membrane separator comprising at least one separating  
membrane which preferentially passes N<sub>2</sub> to obtain an SF<sub>6</sub> enriched retentate  
and a N<sub>2</sub> enriched permeate, wherein said mixture has an initial SF<sub>6</sub> content of  
from 5 to 50 volume-%, said at least one membrane comprises a polymer matrix  
composed of a polycarbonate made from a bisphenol in which at least 25% of the  
bisphenol units in the polymer chain are tetrahalogenated with chlorine or  
bromine, and said mixture is fed to said membrane separator at a membrane  
feed pressure of 10 to 13 bar.

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Thank You

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Date: October 23, 2002

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Firm: U.S. Patent and Trademark Office

Facsimile Telephone Number: 703-872-9310

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From: W. Jackson Matney, Jr. Reg. Telephone Number: 202-624-2738  
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Cam Number: 037110.50483

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Message: U.S. Application No. 09/988,820; Filed November 20, 2001; Certificate of Facsimile and Amendment with Marked-up Version to Show Changes to follow.Hard Copy to Follow: ☐ Yes ☒ No

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: MICHAEL PITTROFF ET AL.  
Serial No.: 09/988,820 Group Art Unit: 1724  
Filed: NOVEMBER 20, 2001 Examiner: Robert Spitzer  
Title: ISOLATION OF SF6 FROM INSULATING GASES IN GAS-  
INSULATED LINES

CERTIFICATE OF FACSIMILE

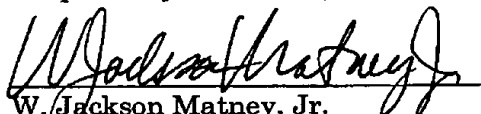
Commissioner for Patents  
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Sir:

I hereby certify that an original of this Amendment with Marked-Up Version to Show Changes (7 pages) is being faxed to Examiner Robert Spitzer at the U.S. Patent and Trademark Office (fax number: 703-872-9310) on October 23, 2002.

Respectfully submitted,

October 23, 2002

  
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